Docking Station for PDA with Added Functionality

Provisional Patent Application of Craig M. Janik

This application claims the benefit of U.S. Provisional Application No. 60/122,727, filed March 4, 1999, entitled Stand or Docking Station for PDA with Added Functionality.

Summary of Invention

This invention is categorized as a base stand or dock for Personal Digital Assistants. More specifically, the dock provides functionality beyond the normal function of the conventional synchronization cradle, that typically provides only a data communication function. The design disclosed here can provide charging, and wired and wireless communication, in addition to the dock providing amplified audible alarm, annunciated, and other audible communication functions. An embodiment shows how the system can be implemented to provide an innovative alarm clock function.

Definitions

A PDA (Personal Digital Assistant) is defined as a small handheld computer, including single-housing devices such as the Palm Pilot, which have a single two-piece clam-shell plastic or metal housing with a display on one side. Typically, the user inputs data and accesses information with the use of a stylus and a touch sensitive display. There are also hinged designs for PDAs which are similar in configuration to portable notebook computers, where there are two housings connected by a hinge, although the PDA is usually much smaller than the portable computer. One housing contains the microprocessor, memory, batteries, and small keyboard, and the other housing contains an LCD.

Background of the Invention

The market for Personal Digital Assistants (PDAs) is growing rapidly as users realize the benefits of having mobile access to their personal information in digital form. Furthermore, wireless communication service providing the capability of transmitting

voice and data in a mobile scenario will increasingly be included in PDA functionality. From an ergonomic perspective, it is always more convenient for users to carry around one small item that combines the ability to access to both data stored locally on the device, and content available on the internet, and to provide voice communications capability. As the price and power requirement of solid state memory decreases, users will be able to carry around larger quantities of information. The Palm Pilot, manufactured by Palm Computing of Mountain View, CA, is a good example of a PDA that is used to increase personal productivity. The Palm Pilot allows a user to carry around and access information pertaining to the user's schedule, to-do list, general memos, and phone and address lists. Included in the schedule function is a useful feature which is the ability to set an alarm for a particular time and date. However, the sound output capability of PDAs such as the Palm Pilot is minimal, in both volume and tone. Typically, simple beeps or simple patterns of tones are provided as alarm sounds.

Another very useful feature of a PDA such as the Palm Pilot is that it synchronizes its data contents with a software application that is used on a personal computer (PC). When the user accomplishes a synchronization event, the digital contents stored in the Palm Pilot PDA are identical to that shown and stored with the PC application. The synchronization is accomplished by placing the Palm Pilot in a cradle, a type of holder with an electrical connection to a port on the PC. When the Palm Pilot is instructed to synchronize, the Palm's internal software and control circuitry opens the connection to the database stored in the PC and ensures that the database on both the PDA and on the PC is the same. As PDA technology continues to evolve, certain product specifications, such as microprocessor power, memory size, and battery life, will continue to improve. However, there is currently no cradle manufactured for the Palm Pilot that provides a standalone capability to use and present data to the user in an enhanced form.

Another example of a product that provides for extensible functionality on a PDA is the Visor, manufactured by Handspring, Inc., of Mountain View, CA. The Handspring is a PDA that includes an electrical interface port so that modules with various other functions can be added to the Visor product. For example, a module could be created that plays MP3 audio files. This is a function that is not included in any PDA. Rather than

carry around a separate product that is a stand-alone MP3 player, the user would snap an MP3 module onto the Visor. Although the Visor modules extend the functionality of the PDA, the system is not actually a dock or cradle, but rather it is based on an attachable expansion module, where the module is carried around with the PDA.

Yet another example of a cradle-like product that extends the functionality of the PDA is the Uni-Mount, manufactured by Revolv of Oakland, CA. The Uni-Mount product, covered by US patent 5822546 to Shawver (1999), is a mounting system for removably fixturing a PDA in a vehicular environment. The Uni-Mount also allows the user to select items on the touch sensitive display by the use of a detented pointer that is positioned along the right edge of the Uni-Mount. Although the Uni-Mount serves the purpose of fixturing a PDA, it provides no extra functionality that uses the data that is stored on the PDA.

Another system for docking and providing communications functions for a PDA is described in US5537343 by Kikinis et al (1996). Kikinis et al show a small PC-card type PDA that docks into the PC-card slot of a portable computer. This system is identical in function to the system that uses an external dock or cradle that is connected to a PC. The added value of the Kikinis et al system is that the dock is integral to a notebook PC, rather than being a stand-alone item.

Summary of the Invention

The present invention exemplifies a new and unobvious art of a dock for PDAs. Briefly and generally, this design for a dock providing additional functionality to the PDA is comprised of the following: a dock for holding a PDA that contains a microphone and a sound amplifying subsystem. When an alarm tone is detected emanating from the PDA, a louder alarm sound is produced by the audio system in the dock.

In another aspect of the present invention, a dock for a PDA includes a housing for supporting the PDA. Contained inside the housing is a microphone, and audio amplifier circuit connected to a speaker, and a computer subsystem that monitors the

microphone and activates either a louder alarm sound or the radio when an alarm sound is detected emanating from the PDA.

Yet another aspect of the present invention is a dock for a PDA that includes a housing for supporting a PDA, a sound sensing device, an audio amplifier circuit, a speaker, a volume control for controlling the volume of the dock's alarm sounds, and a switch for selecting either an alarm tone or the radio as the wake-up alarm. Again, the alarm or radio in the dock is triggered by the alarm tone that is produced by the PDA.

List of Drawing Figures

FIG. 1 shows two isometric views of the alarm clock docking 20 with the PDA 10 placed in the cradle area.

FIG. 2 shows two isometric view of the alarm clock dock 20with the PDA 10 not shown.

FIG. 3 shows an exploded assembly view of the alarm clock dock 20.

FIG. 4 shows a view from the underside of the alarm clock dock 20 top housing 10.

FIG. 5 shows the alarm clock dock 20 with no contact block 30.

FIG. 6 shows the alarm clock dock 20 with an extended light pipe 62 along two sides of the docking surface.

FIG. 7 shows a view from underneath the top housing 10, showing how the light pipe 62 transfers the IR signal to a transceiver on the motherboard.

FIG. 8 shows a block diagram of how the PDA 10, a general purpose personal computer, and the alarm clock dock, would communicate.

Description of Preferred Embodiment

Referring now to FIG. 1, a PDA 10 is shown docked to an alarm clock dock 20. Alarm clock dock 20, is shown in FIG. 2 without PDA 10, and in FIG. 3 in an exploded assembly view. PDA 10 is typical of many such devices now available and it will not be described in detail here. Alarm clock dock 20 is designed as a simple two piece clamshell assembly, including a top housing 10 and a bottom housing 14. This type of assembly is well known in the electronics industry and many of the details of fastening

and assembly, such as screw bosses, screws, and related components, have been omitted for the sake of clarity. FIG. 2 shows the area where PDA 10 is placed in more detail. The design of alarm clock dock 20, as shown in FIG. 5, without the contact block 30, allows it to be used with any size or model of PDA, since the slot for the PDA is not size constrained by the alignment of contact block 30 with a electrical contacts on PDA 10. PDA 10 is placed on the angled surface 34 up against the single vertical wall 38.

Alarm clock dock 20 contains a circuit board 32 that includes that functionally connects a radio tuner circuit 66, station selection components 74, and a microcontroller 86. Microcontroller 86 controls the functionality of the device via function electrical connections to the components and firmware described above, and a LCD 18 for showing the radio tuning information and for showing the time. It also contains a speaker 46, a sound amplifying circuit 70, a volume knob 78, and tuning knob 82, as external controls. Volume knob 78 and tuning knob 82 are not shown because their design of these elements into a radio device would be obvious to a designer experienced in the field. Alarm clock dock 20 also includes an alarm mode switch 58 for setting whether a loud wake-up alarm sound, or the radio, is used as the wake-up sound. Again, this control would be obvious to include on a clock radio and are well known so it has not been included here. Alarm clock dock 20 could be either plugged into AC wall power or it could run on batteries, or both, as batteries could be included as a backup in case of AC power failure. Again, components from the power subsystems are not shown since they are well known in the field of electronics design. As shown in FIGS. 2, 4, and 5, alarm clock dock 20 also contains a microphone 54 on the inside of the housing, placed against vertical wall 38 that faces PDA 10. Microphone 54 is on the other side of microphone grill 26 so that sound is permitted in from the outside of alarm clock dock 20.

Next, the operation of the device will be described. The purpose of microphone 54 and the related functional circuitry is that it is used to trigger the alarm event, which is either a loud alarm tone or the playing of radio broadcasting, based on an alarm sound from the alarm function included in PDA 10. The user would set an alarm in the schedule software application included in PDA 10, say for example, for the alarm to go off at 6:00 am. The user would then place PDA 10 in alarm clock dock 20. At 6:00 am the PDA's alarm would sound, but this typically isn't very loud, or it isn't what many

users want to wake up to. They might want to wake up to music or news. Microphone 54 is located very close to PDA 10, as shown in FIG. 1, so that the alarm sound from PDA 10 triggers alarm clock dock 20, that is, it sets off the alarm clock dock 20, so that either music, news, or a louder alarm sound is heard, depending on how the user sets up alarm clock dock 20. Microphone 54 is electrically connected to a circuit on the dock that is triggered by the signal from microphone 54. Microcontroller 86 in the alarm clock dock 20 controls this triggering subsystem based on its firmware which is software that is permanently install in microcontroller 86, as well as the rest of the alarm clock functions. The triggering subsystem would include signal filters so that ambient noises wouldn't trigger alarm clock dock 20.

Once PDA 10 has triggered alarm clock dock 20, it functions similarly to other alarm clocks in that it includes snooze button 22. The snooze interval would be settable.

Although the description above contains many specificities, these should not be construed as limiting the scope of the invention, but merely providing illustration of some of the presently preferred embodiments of this invention.

Alternative Embodiments

An embodiment of this design could also contain a circuit, subsystem, and software programming function where the alarm clock dock could learn to recognize a specific alarm sound from a specific PDA, and trigger when that sound is being played. The reason for this function is that many different PDAs could be used with one alarm clock dock design. The ability for one alarm clock dock design to support many different PDA products is supported by the physical design of the alarm clock dock, as described earlier. The use scenario for the "learn" function is as follows. The user would set the alarm clock dock to "learn alarm sound" mode, via a switch on the alarm clock dock, as shown in FIG. 5. The user would then initiate an alarm sound from the PDA and place the PDA on the alarm clock dock. The alarm clock dock would "listen" to this alarm sound, essentially performing a wave form sample of the PDA's alarm sound, and record this alarm sound wave form data into memory. Then the alarm clock dock is placed in "alarm/clock radio" mode. When that same alarm sound is played into the alarm clock dock's microphone, the wave form is compared to the wave form in memory and the

microprocessor triggers the alarm clock dock's alarm subsystem, this would be whatever the user had chosen, loud alarm sound or clock radio. There would be a switch on the outside of the alarm clock dock that had two settings: "learn alarm sound" and "alarm/clock radio".

In another alternative embodiment, the PDA and the alarm clock dock can communicate, that is, they can share and exchange data. A protrusion called a contact block is located at the bottom of the PDA docking surface, as is shown in FIG. 2. This contact block extends up into a corresponding indented area on the PDA. There are metallic contacts located here that mate against corresponding metallic conductors in the indented area of the PDA. The design of this type of connection system is well known in the field of portable computer design and will not be addressed here in detail for reasons of brevity. However, it is important to note that when the PDA is placed on the docking surface and the electrical contacts are made, data can be transferred between the PDA and the alarm clock docking station. For example, if the PDA was in place on the alarm clock dock, it could trigger the alarm clock dock to set off the wake-up alarm electronically, rather than using the alarm sound created by the PDA. In this particular embodiment then, the alarm clock dock would not have to include the microphone and corresponding grill, although it is shown in the figures. The alarm clock dock could also receive information regarding the user's schedule. The alarm clock dock would synthesize speech and wake the user up by annunciating the user's schedule entries. This would require a substantially powerful microprocessor and audio subsystem. The user could choose to have other information audibly stated. For example, important dates that are looming in the near future, such as birthdays and so on could be annunciated in the wake-up statements. Another example would be that the PDA could read a shopping list that the user has to fulfill that day.

In the above alternative embodiment where the PDA and alarm clock dock share data, the data connection between the PDA and the PDA docking station need not require metallic or conductive contacts. The connection could be made via infrared signal transceiver ports that are included in both the PDA and PDA docking station. The infrared signal transceiver on the docking station would be located within a line of sight, or within a light bouncing distance, of the corresponding docking station transceiver. As

shown in FIGS. 6 and 7, the infrared signal could also be transmitted to the transceiver in the docking station by a light pipe. The microprocessor subsystem would be connected to the transceiver and would be able to interpret and store the data. It should be noted that the design of the light pipe will allow for the use of many different PDA designs since the window area of the lightpipe is so long and extends along two perpendicular surfaces. Many of the PDAs will have an IR transceiver port located at different points along the short edge of the PDA, but it is likely that some orientation of placement will locate the IR port adjacent to some section of the lightpipe window. The vertical lightpipe connection to the IR transceiver on the motherboard is well known in the field of mobile computer design and will not be addressed here.

The PDA alarm clock docking station could also charge the batteries in the PDA, in any of the embodiments where the contact block is able to make an electrically conductive connection to the PDA.

A wireless communication system could be used, such as the Bluetooth system promoted by Intel, of Santa Clara, CA, among several other computer companies. Bluetooth is a short range, high bandwidth communication system for electronic devices. In that case, the PDA may or may not be docked in the docking station. The docking station could still function as an alarm clock, receiving data about when to trigger and about what audio content to play, wirelessly from the PDA, as long as it is within range of the docking station. For example, if the user carried the PDA in a briefcase, the PDA would be left in the briefcase when the user was at home, but the PDA is in the wireless range of the alarm clock station (rather than calling it a dock). The PDA is always polling, at some duty cycle, to see if it is in range of a corresponding device, such as the user's desktop computer or the alarm clock station. In fact, the PDA would automatically synchronize with the desktop computer, or even a portable computer, when in range, and there was new content on either the PDA or desktop computer. The alarm clock station would not be required to have the slot for placing the PDA on the station, rather, it would look more like a conventional alarm clock. It would contain the wireless communication hardware, chips, antenna, etc. This technology is well known in the field of mobile computer design and will not be addressed here in detail. However, because of the polling, the PDA would wirelessly (RF in this case) transfer the desired content regarding

the wake-up times and alarm-sound content to the PDA alarm clock station. This transfer would happen any time that the PDA was within range of the alarm clock station, and if there was a programming change, that is, a new programming content for the alarm clock station.

In the embodiments where the PDA and alarm clock dock are sharing information, the PDA could be used to program the alarm clock dock to perform more complex or customized functions than would normally occur with a conventional clock radio. The PDA could contain a custom program that exists specifically to program functions in the alarm clock dock. For example, the PDA could send the alarm clock dock instructions for a customized wake-up sequence that would consist of sounding a wake-up alarm for 5 seconds, then turn on the clock radio for 5 seconds, then turn off for 1 minute. The custom sequence could be anything the user wants. All of these intervals could be programmed from a program interface on the PDA. It could also be programmed on the user's PC, using a desktop program that is specifically designed to create alarm clock command data. This data would be downloaded (synchronized) with the user's PDA in the typical exchange that happens between PDAs and desktops or portable notebook computers (general-purpose computers). Then this data would be downloaded into the alarm clock dock via any of the data transfer schemes mentioned above. Since the control interface in this embodiment begins on a desktop computer, the user would have access to customized sound files, such as .wav files that are found on most computers now. These sound files could be selected as part of the sound that is used as the wake-up alarm. These sound files would be transferred onto the PDA as part of the alarm clock dock control file when the PDA and desktop computer synchronize, and in turn transferred into the alarm clock dock via the communication scheme between the PDA and the alarm clock dock.

In yet another embodiment, the alarm clock dock could have a wired or wireless connection to the internet. News items or other types of content that interest the user could be selected to be downloaded into the PDA via the data connection between the PDA and the alarm clock dock. These same news items could be annunciated to the user as a wake-up alarm. Or the user could select a combination of radio news, which also

could be delivered over the internet connection, daily schedule, and music, in pre-selected intervals, as the wake-up programming.

In yet another embodiment, the alarm clock station is either wirelessly connected to the desktop or portable computer, via a system like Bluetooth, or it is connected via a wired connection, such as an ethernet connection. The main idea here is that the main computer that the user uses to keep scheduling information has some data transfer link to the alarm clock station. It is important that the latest schedule and programming information be available to the alarm clock station, since it needs this information to perform the correct wake-up tasks. The system could work as shown in the two block diagrams in FIG. 8, where either the PDA communicates with both the general purpose computer (desktop or portable) and the alarm clock station, or, the PDA communicates with just the general purpose computer, and the general purpose computer communicates with the alarm clock station. For example, using scenario 1, the data connection between the PDA and the general-purpose computer could be wireless (Bluetooth) or IEEE 802.11 standard, and the connection between the general purpose computer and the alarm clock dock would be ethernet.

Another embodiment of the docking system that provides an advance in functionality is a system where the PDA includes MP3 audio file storage and playback functionality. An example of this would be the Visor PDA described previously. In this case, the dock could contain an audio amplifier and a set of high quality speakers. When the PDA was placed in the dock, an electrical connection is made with the docking contacts such that the musical signal is amplified by the dock and played through the speaker system.

I claim:

1. A dock for holding a PDA comprising in combination:
   a sound sensing subsystem,
   a sound amplifying subsystem for producing a substantially louder second sound based on a first sound that is detected by said sound sensing subsystem.

2. A dock for a PDA comprising in combination:
   a housing for supporting said PDA,
   a sound sensing device,
   an audio amplifier circuit,
   a speaker,
   a computer subsystem for producing a sound which is an alarm tone when said sound sensing device detects a sound from said PDA.

3. The dock of claim 2 where the sound that is produced by the dock is radio broadcast content.

4. A dock for a PDA comprising in combination:
   a housing for supporting said PDA,
   a sound sensing device,
   an audio amplifier circuit,
   a speaker,
   a volume control for controlling the volume of an amplified radio signal,
   a switch for selecting either an alarm tone or an amplified radio signal as the sound that is produced when a sound is sensed.

Abstract

A dock for a Personal Digital Assistant includes a housing with a PDA docking slot, a microcontroller, a microphone, an audio amplifier, a radio tuner, and a speaker, all functionally connected and contained in the housing. An alarm tone from the PDA triggers a louder alarm sound or the radio. An alternative embodiment includes an electrical connection from the PDA to the dock for transferring data to the dock where it is audibly presented to the user.

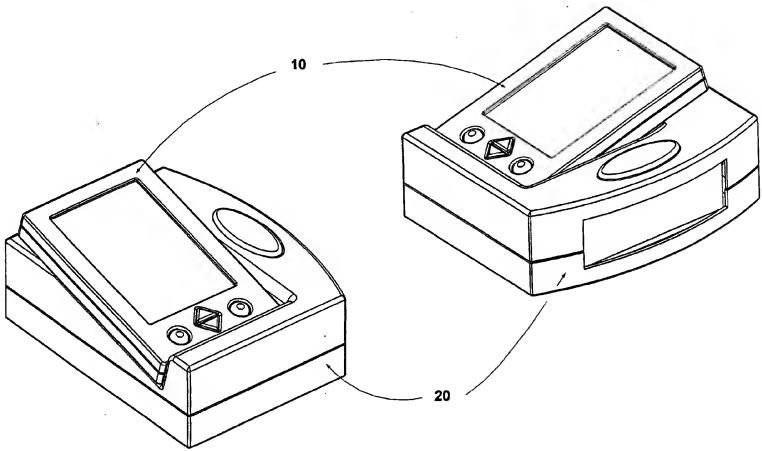

FIG. 1

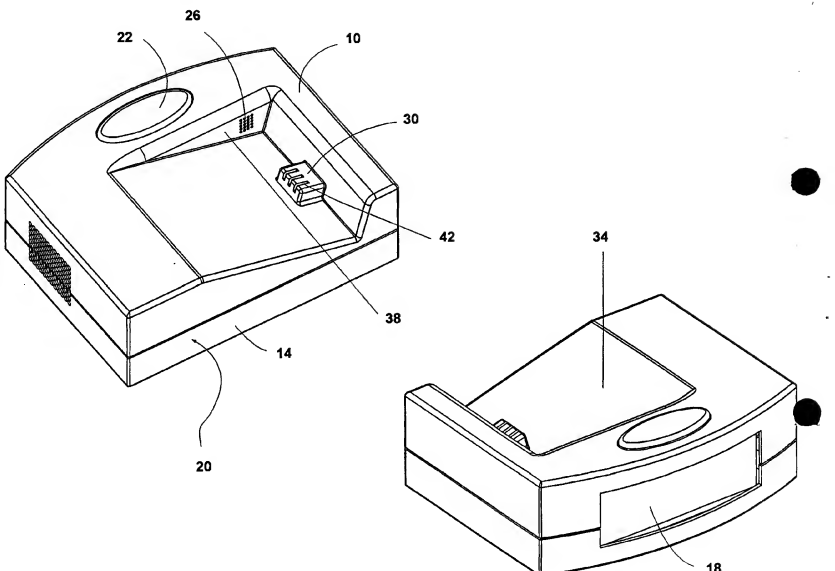

FIG. 2

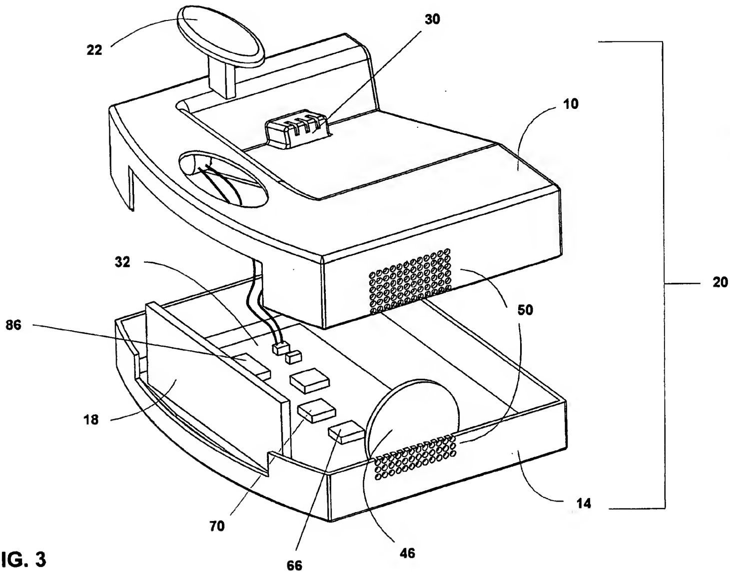

FIG. 3

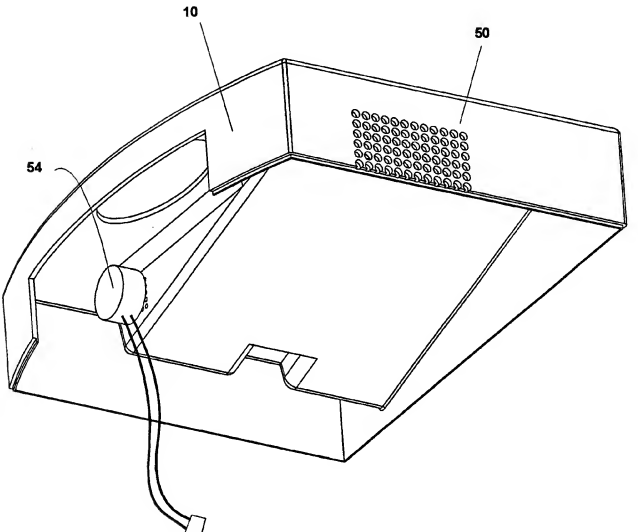

FIG. 4

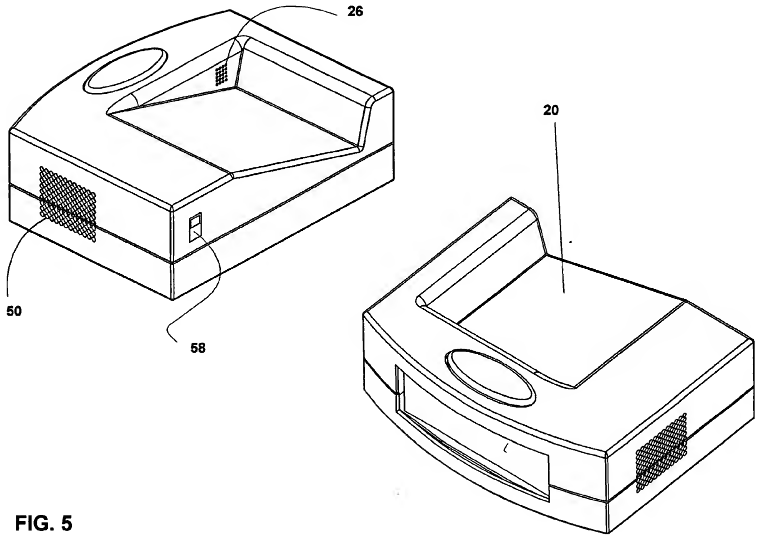

FIG. 5

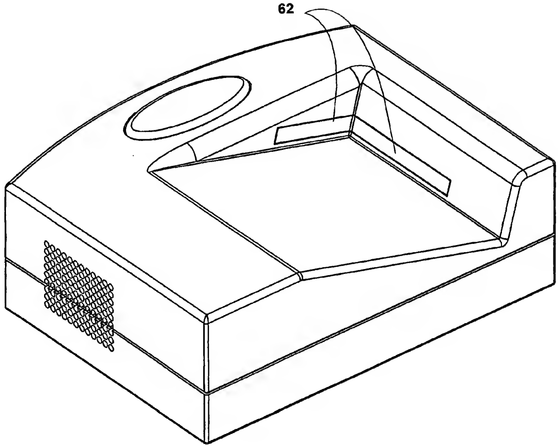

FIG. 6

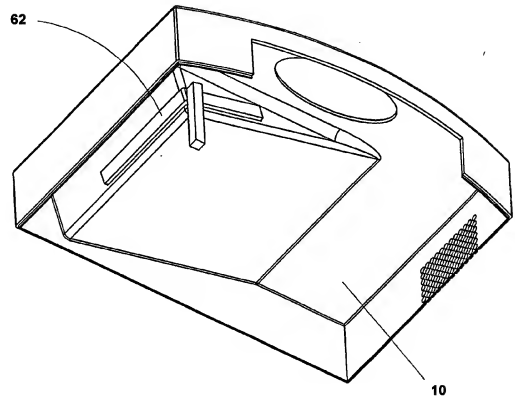

FIG. 7

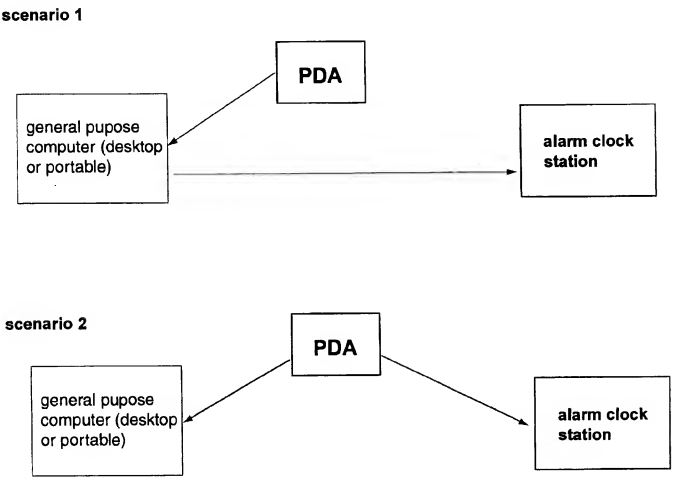
scenario 1
PDA
general pupose computer (desktop or portable)
alarm clock station
scenario 2
PDA
general pupose computer (desktop or portable)
alarm clock station

FIG. 8